

## Social Psychology on the Flight Deck

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### Abstract

Social psychological and personality factors that can influence resource management on the flight deck are discussed. It is argued that personality and situational factors intersect to determine crew responses and that assessment of performance under full crew and mission conditions can provide the most valuable information about relevant factors. The possibility of training procedures to improve performance on these dimensions is discussed.

NASA research has developed a strong case for the need to understand and improve resource management on the flight deck. Examination of data from full mission simulations, as well as from transcripts of accident reports and ASRS incident reports, convincingly documents how less than optimal management and utilization of human resources in the cockpit can lead to disastrous outcomes. Considering flight crews as small groups, a number of social psychological factors can be isolated that are relevant to crew performance. These would certainly include leadership, group relations, and communications patterns. I hope today to look at the flight deck from the perspective

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of a personality and social psychologist

Much of my own research over the past 15 years has dealt with situational and personality determinants of crew performance under conditions of high stress. My research activities have dealt largely with the Navy and NASA's space program rather than commercial aviation, but I hope to argue convincingly that the psychological factors involved are highly similar.

By way of preface, I would like to say a few words about psychology's contribution to understanding crew performance. Everyone, of course, is aware of the contribution human factors research has made to technical performance. Personality psychology has concentrated on the development of psychometric instruments for personnel selection and for the prediction of performance and/or adjustment. Social psychology has focused on group processes relevant to individual and crew performance. Before attempting to argue that social and personality psychology can contribute to this area, it might be worthwhile to explore some of the reasons why it has not been heavily utilized.

One problem with personality assessment has been a strong emphasis on screening out unlikely or psychopathological candidates rather than selecting in prospects with optimal psychological characteristics. Part of the problem comes from a lack of consensus regarding just what an optimum psychological profile consists of. Further, one must decide what the criteria for validation of selection procedures should be. Should one look at successful line operation over an extended period or at performance in emergency situations, or at some weighted combination of these and other measures? I will return to the question of reactions

in different situations later.

Social psychologists, on the other hand, have tended to ignore personality variables and to concentrate on tightly controlled laboratory experiments. Such studies may have great scientific rigor, but the consumers of research have rightly questioned the generality of such research to the complexities of real world problems such as combat or aviation.

But perhaps the most serious failing in our approach to complex problems of crew performance comes from ignoring the fact that behavior is a function of the interaction of personality and situational factors. What I mean is the realization that behavior in any given situation is jointly determined by an individual's personality and by the nature of the situation. The personality type associated with the best performance in one setting could be associated with failure in another. As I have noted, personality psychologists have concentrated on personality typologies rather than the implications of personality types in a range of situations while social psychologists have been equally cavalier in ignoring the impact of personality in situations, focusing almost completely on specifying the aspects of the particular situation associated with behavioral outcomes.

Examination of the field suggests that a healthy awareness of these problems has developed along with much more sophisticated methodologies, that enable the examination of complex situations in a rigorous manner. Unfortunately, we have only begun to demonstrate what we can do with our newly-gained expertise. In the remainder of my presentation, I will discuss some of the personality and situational variables that I see as

crucial for resource management in aviation. As an aside, let me note that I am aware of the severe constraints that operate on any large organization involved with selection and maintenance of high level personnel. The person with the best psychological profile may be deficient physically or may lack technical expertise on any combination of the above. Once selected, a rigid seniority system can over-ride other considerations in crew composition. The challenge is to obtain the optimal outcome within these constraints.

A large number of personality dimensions have been specified through research, many with considerable overlap. Obviously, one must choose by some means the subset of characteristics deemed relevant to the situation at hand. In our research, we have begun with performance and group adjustment and have worked toward the isolation of relevant trait clusters. Let me describe the possible implications of two trait dimensions across several hypothetical situations. We have found two dimensions to be strongly and widely related to group and individual reactions. The first cluster can be called instrumentality or goal orientation. The second cluster can be called expressivity or group orientation. Persons high on this dimension tend to be sensitive to the feelings of others and interpersonally warm.

How theoretically should these dimensions relate to flight-deck performance? In routine flying one would expect a moderate relationship between performance and goal orientation and a minimal relationship between performance and group orientation. One could predict, however, that those high in group orientation would establish warmer and more effective working and personal relationships with all co-workers.

In the case of individual performance in emergencies, I would expect the highly goal oriented individual to excel. In general, instrumentality would seem a good candidate as a selection measure and expressivity a nice, but non-essential factor. Validation using line performance and simulator performance in emergencies should verify the relevance of goal orientation and the lesser importance of group orientation.

However, from the perspective of resource management and the contention that a significant proportion of accidents involves a failure to work optimally as a team, a different approach is suggested. Validation of predictors of crew performance, to the best of my knowledge, typically does not involve assessing the reactions of a complete crew during conditions of work overload or other in-flight crises. It is my thesis that validation under these conditions might suggest a different constellation of optimal personal characteristics. I would argue that when total crew response to crisis is examined, the best outcome (operationally defined as optimal responses to the situation by all crew members) might be in crews where the captain in particular was high in both goal and group orientation. Such individuals might be expected to be both competent in dealing with the technical aspects of the problem and attuned to the reactions and performance of others.

My interest here is not to develop an argument for the adoption of a new set of personality measures. Rather, I am trying to stress that if the premise that resource management and associated group performance are important contributing factors to efficient line operation, then the

evaluation of individual performance may fail to capture the crucial dimensions of crew behavior in stressful situations.

I cannot resist an aside on the personality issue, however. In discussing resource management and flight crew performance with a number of experts, one of the major points which emerged spontaneously was the "problem of the macho pilot." This has also been an issue of some importance with astronauts, particularly in the reluctance to accept females and to shift to a different mode of operation with the space shuttle. I won't get into trying to define "macho" because I think definitions of this type of individual are widely shared. We have been concerned with this personality type in our research, especially in evaluating relations between the sexes and their relation to performance. Suffice it to say that the personality constellation which most closely approximates the macho image is the highly instrumental-low expressive one.

Turning to more general social psychological factors which may influence crew performance, let me first define the social environment of the flight deck. Although the primary group of interest consists of the Captain, First Officer and Flight Engineer, the critical social network is larger and more complex. In thinking about social interaction it is essential to include those in voice communication and intermittent direct contact. Thus the system should include Air Traffic Controllers, Company Operations, the Cabin Crew and indirectly, the passengers.

The Air Traffic Controller is a central figure in the social network and his role in flight deck operation should be considered. For

example, take the recent study of potential accidents by NASA around which there has been controversy (as written up, for example, recently in Science). One interpretation of the data is that there may be a greater risk of collision, as measured by incident reports, when under direct control. Without becoming embroiled in arguments about the need for control and differences in risk at various locations, it seems worth noting that a line of social psychological research would predict decreased vigilance under positive control. This research has to do with diffusion of responsibility. This series of investigations was stimulated by the observed phenomenon of individuals failing to take action in emergencies or redefining the situation as non-threatening when others are present and capable of taking action. The most widely cited example is the murder of Kitty Genovese outside her apartment. She was stabbed repeatedly over a 30 minute period while 38 people watched and none called the police. Individuals in such situations may have a diminished sense of responsibility, feeling, perhaps unconsciously, that others will handle the incident. It is possible that being under positive control leads to reduced vigilance on the part of crews, even though they are fully aware of their responsibility for the aircraft.

Indeed, the increasing automation of aircraft functions may serve the undesired function of reducing the crew's sense of autonomy and personal responsibility. In a recent interview, a senior Captain made the following comments: "We are the best trained instrument pilots in the world, but we're not training to look out the window any more. It's easy to go cross-country on radar, and have somebody else do everything

for you. Sometimes we say to each other up there that the janitor could fly the plane as well as we do!"

In a similar vein, consider the social psychological ramifications of data from the full mission simulation study conducted by Ruffell Smith. The data suggest a higher error rate when a particular crewmember is in a state of work overload. In many continuing abnormal situations or emergencies, such as engine failure, in addition to dealing with the operation of the aircraft, it is necessary to coordinate the actions of the cabin crew and to communicate with the passengers. In several instances, for example, the assumption of control of the aircraft by the Captain while attempting to make important overall decisions concerning the flight was associated with serious errors.

I find no reason to question the authenticity of these findings. Indeed, I would expect such outcomes to be more frequent in emergencies during line operations than during simulations because of the objective danger.

What are some of the implications of overload on pilots during non-routine flying conditions? From a psychological viewpoint, the leader, decisionmaker is the least appropriate person to be overburdened. Given that research shows a narrowing of perceptual attention under stress, one can argue that it is probably not optimal to involve the Captain in multi-processing a variety of tasks--such as flying the plane, coordinating the activities of the flight and cabin crew, and making the ultimate decisions regarding actions to be taken. It is likely that the quality of each of these activities will be



degraded if all are undertaken simultaneously.

Another psychological factor can add to the burden on the Captain. This is increased dependency of crew members on the Captain under stress. In our research on groups under stress and in a number of other studies, group members are seen to become increasingly dependent on the leader under high stress conditions. Thus, the Captain is likely to bear additional responsibility for monitoring and directing the performance of the crew. Conversely, by failing to monitor the responsibilities of other crew members during the critical period, the Captain may seriously overload other crew members. An example of the negative effects of overload on the flight engineer was nicely shown in the Ruffell Smith study.

Along with increased dependency under stress, crew members may also experience a diminished sense of responsibility in an emergency, placing more of the responsibility on the leadership of the Captain. This could be intensified if the Captain relieves the First Officer of flying responsibility. Indeed, the exercise of leadership by the Captain in critical situations probably represents a clear example of a personality by situation interaction. As an hypothesized example, the authoritarian type of individual may be generally disliked as a Captain in normal operations. Such an individual may, on the other hand, take charge very effectively in emergencies and be well suited to coping with the dependency of crew members. The democratic, socially concerned leader might be highly valued during routine operations, but find it more difficult to assume a strong leadership role when the situation demands it. It is possible that specific training in role performance conducted

with groups under simulated routine and emergency conditions could improve performance markedly.

Another social psychological aspect of emergency situations which warrants attention is the management of communications. Given a perceptual narrowing and a high density of necessary internal and external communications in critical situations, it is quite possible that breakdowns in the processing of important communications could play a significant role in crew errors. An important task of the Captain would appear to be maintaining close supervision of all communications, eliminating unnecessary communications and ensuring that all critical data are understood. This is obviously an implicit part of the Captain's role, but I would bet a tank of gas that a significant number of communication breakdowns can be observed under high workload and emergency situations.

Another type of person-situation interaction that I think is likely to emerge concerns situations involving crews with a female member. From my own research assessing the performance of women in demanding roles under high stress, I have every reason to believe that the individual performance of female flight crew members will be equal to that of men in every respect. I further suspect that normal, line operations involving female flight personnel should show no differences. However, in work overload and emergency situations where male crew members have reservations about the competence of females, crew performance may be seriously impaired. The recommendations and/or actions of the female may be questioned or not accepted. Male crew members may take over some of the female's responsibilities, creating

further work overloads. In the case of a female Captain, the junior male crew may attempt to usurp the Captain's responsibilities. If this sounds far-fetched, it can be pointed out that such occurrences were noted among several all-male crews in the Ruffell Smith study. A similar complaint about attempted take-over of Captain's responsibilities by a very senior First Officer can be found in the ASRS reports. In any event, I would argue that as women become more widely integrated into crews, the question of crew coordination under stressful conditions should be investigated with high priority. Our friend the "macho pilot" is likely to play the pivotal role in such scenarios. The following relevant views were attributed to a pilot in a recent story in the Washington Post. "He did say that even though the men pilots don't slander their female co-workers when flying, most would rather not fly with a woman. He added that being a pilot calls for and attracts a very powerful, if not 'macho', personality."

On a more negative note, I would like to mention a line of research that has been quite influential in organizations. This is the examination of the relationship between group cohesiveness (defined as the mutual attraction of group members and their sense of group membership) and performance. In general, it has been noted that highly cohesive crews also show superior performance. This has led to a number of attempts in organizational settings to institute training programs to improve group climate and cohesiveness with the assumption that improved group relations will lead to improved performance. The results have been distinctly mixed. Our research with well-motivated professional crews (in this case with Aquanauts working underwater in a very

structured environment during Project Tektite) suggests a rather different sequence of courses. In looking at performance and group climate over extended periods of time we found that positive changes in crew performance led to more group cohesiveness while positive changes in cohesiveness had no influence on performance. This suggests that many training programs have been dealing with effects rather than causes. In other words, training efforts could more profitably be directed toward facilitating group performance, in which case group relations should be quite good. A part of such training might include emphasis on how personality types influence group performance in different types of situations.

I have only touched on a few instances where I feel social psychological factors may have a significant impact on flight deck performance. I feel strongly, though, that a case is developing for the importance of human resource management for safety in flight operations. I would suggest that a two-tiered approach to the issue might be optimal.

First, I feel that additional data on the influence of social factors on performance during work overload and emergency situations are needed. Controlled data of this sort can best be obtained during full mission simulations. However, an important additional source of data would be the social psychological analysis of cockpit and flight recorder data from accidents where NTSB investigation has concluded that crew error has played a significant part.

Assuming that unequivocal evidence can be amassed showing decrements in performance and less than optimal reactions to abnormal

situations as a function of social psychological factors, it should be quite feasible to develop training procedures to help crews cope with such situations more effectively and even to improve person/situation fit. In my opinion, mission simulations with extensive critiques of group as well as individual performance would be the most impactful means of implementing this. I also believe that highly effective training tapes could be developed highlighting the types of deleterious resource management isolated in such research.

As a final note, I would stress that from a social psychologist's viewpoint, a program in resource management will only be successful if it is apparent to line personnel that it has the complete and unequivocal support of management. The implementation of such a shift in training must also be done with some delicacy regarding the self-images of crew members. I think an example from the merchant marine is highly instructive. One of the major oil companies which operates a large tanker fleet did a careful analysis of Captain's duties and concluded that the Captain's job definition really consists primarily of the management of complex resources, both human and material. It was therefore decided that the job description should reflect this. Accordingly, all of the fleet captains were informed that, effective immediately, they were no longer Captains of their vessels but instead were Shipboard Managers. Somewhat to management's surprise, the reactions of these managers was distinctly hostile. Their title somehow failed to capture the image of salt-spray and rolling seas which they had spent years acquiring.

I doubt if the title Aircraft Manager would find much acceptance

among your Captains even though it may reflect the reality of today's operations. On the other hand, I feel that concrete demonstrations of the need for crew coordination and careful management of resources will lead to rapid acceptance of the concept. The Ruffell Smith study provides a good starting point. The very favorable reactions of the crews involved suggest that awareness of a problem area can come rapidly under the proper conditions.

Our case is not proven, but I hope that time will bear out the importance of dealing with social psychological factors on the flight deck. I feel that we can demonstrate quite conclusively that a significant contribution can be made to your operations. If we convince you of this, social psychology can assume a place as a significant resource in commercial aviation.